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Underplanting tests with red and white pine in Southern Ontario

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The Experiments

Different methods of hand planting in old cut-over and burned areas which retained some overstory were investigated in two experiments established in 1955-56 (Experiment 1) and 1958-59 (Experiment 2). The sites were in Sabine Township, east of Algonquin Park. The experiments included spring and fall plantings of red pine (Pinus resinosa Ait.) and white pine (P. strobus L.), using four planting methods: Sandvik tool (SFI-hacka); T-shaped cuts, round shovel; slit, round shovel; and wedge, straight spade.

The planting stock was from selected 2-0 beds at Kemptville Nursery, randomly divided into plots to provide stock for fall and spring planting. Seedbed density averaged about 475 trees/m^2. In Experiment 1, white pine averaged about 7.5 cm and red pine about 10.2 cm in total height. In Experiment 2, the stock for both species was slightly larger, namely 10-15 cm.

The experimental plan for each species had five replications with a randomized split-plot for fall and spring planting, within which the four planting methods were randomized in plots of 50 trees; 2000 trees were planted in each experiment.

The fall plantings were done on October 27 and 28, 1955, which was somewhat later than routine work in the area, and on September 30 to October 2, 1958. At both times the weather was cool and rainy. The spring plantings were done on May 19-22, 1956, also a cool and wet period, and in early May, 1959, when some frost was still in the ground.

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The Planting Sites

Experiment 1 (1955-56) was in a recently burned area, quite level, comprised of a fine to medium Petawawa sand, and well drained. The red pine planting site had an overstory of scattered trembling aspen (Populus tremuloides Michx.) and large-toothed aspen (P. grandidentata Michx.). The ground cover was grass and moderately dense fern, chiefly bracken (Pteridium aquilinium (L.) Kuhn). The white pine planting site was adjacent, with a denser overstory (about 125 trees/ha) of the same species of larger size. The ground cover of grass and fern was much lighter.

Experiment 2 (1958-59) was on similar soil conditions to Experiment 1 but on an older cut-over and burn. The overstory was also denser, containing about 200 trees/ha, with some conifer. The ground cover contained some blueberry (Vaccinium spp.).

The Results

The average survival at 1 and 15 years is summarized in Table 1, for season and method of planting. The interactions of planting method within season of planting were not statistically significant and are not shown.

Survival was much better in Experiment 1 than in Experiment 2, possibly due to differences in stock, in site (overstory and ground competition) and climatic differences between planting times and years. The use of 2-0 stock under conditions of high competition for moisture has probably contributed to mortality and poor growth (Mullin, 1968; Carmean, 1971). Larger and stronger stock is needed, i.e. stock that will compete more aggressively.

For red pine, the season of planting had no significant effect on survival or height growth in the first test. In Experiment 2, the fall planting resulted in poorer survival than spring planting as might normally be expected for seedling stock (Stiell, 1958). The excellent results of fall planting in Experiment 1 may have been due to the beneficial effect of late lifting and planting (end of October); this agrees with current studies of cold storage effects which have shown that red pine must be lifted very late to ensure safe storage.

For white pine, the results are conflicting. In Experiment 2, spring planting resulted in better height growth than fall planting but in Experiment 1 the reverse was true. The poorer height growth in spring planting of Experiment 1, the reverse of the normal situation, was possibly the result of rabbit clipping which was observed on the spring planted seedlings. Apparently white pine was damaged more than red pine. Spring planting of white pine is still recommended where possible.

The results showed no significant differences between planting methods for either species in Experiment 1. In Experiment 2 where competition was greater, there were significant differences for red pine in first-year survival, although not in survival or height at 15 years. For white pine at 15 years, survival was significantly better for the wedge method than for the others (64.0% vs. 51.8 - 54.6%), and height was highly significantly poorer for the Sandvik tool planting (105 cm vs. 121 - 125 cm).

TABLE 1. Survival and height averages by season of planting and method of planting at 1 and 15 years for red pine and white pine

	Red Pine			White Pine		
	1st yr.	15th yr.		1st yr.	15th yr.	
	Surv. %	Surv. %	Ht. cm	Surv. %	Surv. %	Ht. cm
Experiment 1						
By Seasons						
Spring	81.8	72.3	275	92.3	74.0	215
Fall	85.4	72.1	280	90.9	76.5	237
	NS	NS	NS	NS	NS	*
By Methods						
S	85.2	72.4	262	91.0	76.6	221
T	83.8	70.8	289	91.4	77.4	219
SR	81.8	74.0	290	90.6	73.4	209
W	83.6	71.6	268	93.4	74.8	222
	NS	NS	NS	NS	NS	NS
Experiment 2						
By Seasons						
Spring	70.9	55.3	153	58.1	54.7	127
Fall	41.4	34.4	145	66.9	56.5	111
	*	*	NS	*	NS	*
By Methods						
S	51.4a	40.4	142	63.0	51.8a	105a
T	57.0ab	45.0	152	61.8	54.6a	125b
SR	54.4a	48.2	154	59.2	52.0a	124b
W	61.8b	45.8	151	66.0	64.0b	121b
	*	NS	NS	NS	*	***

NS = Not significant
* = Significant at 5.0% level
** = Significant at 1.0% level
*** = Significant at 0.1% level

S = Sandvik tool (SFI-hacka)
T = T-shaped cuts, round shovel
SR = Slit method, round shovel
W = Wedge method, straight spade

Items not followed by same letter are significantly different at 5.0% level or better.

In terms of aggregate height values (Mullin and Howard, 1973) which combine the effects of survival height (averaging both species and experiments), the Sandvik tool method produced about 9% less aggregate height at 15 years than the other methods: Sandvik tool, 3291 m/ha; slit method 3590 m/ha; T-shaped cuts, 3640 m/ha; and wedge method, 3652 m/ha.

The Recommendations

Larger and stronger stock that will compete more aggressively should be used under conditions of high competition. Early release is also recommended.

The Sandvik tool should not be used for planting where adverse growing conditions exist.

Spring planting of both red and white pine is still recommended.

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